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Status of Publications

Published

Walker, Michael M. 1984. Magnetic sensitivity and its possible physical basis in the yellowfin tuna, *Thunnus albacares*. In: J.D. McCleave, G.P. Arnold, J.J. Dodson, and W.H. Neill (editors), Mechanisms of migration in fishes, pp. 125-141. Plenum Press, NY. (NATO Conf. Ser. IV, Mar. Sci. Vol. 14.).

Many animals are known to orient to magnetic fields. However, two central problems in the study of magnetic sensitivity have been the almost complete failure of magnetic field conditioning experiments and the lack of evidence for a feasible transduction mechanism. In the studies reported here yellowfin tuna learned to discriminate between two Earth-strength magnetic fields in a discrete-trials/fixed-interval conditioning procedure. Magnetometry experiments, diffraction spectra and electron microscope analyses demonstrated single-domain crystals of the ferromagnetic mineral magnetite in the head of this species. The crystals are concentrated in tissue contained within a sinus formed by the ethmoid bones of the skull. Theoretical analyses show that the crystals would be suitable for use in magnetoreception if linked to the nervous system. The physical properties of the crystals would determine the operation of magnetoreceptor organelles and constrain the capacities of the magnetic sense. Tests of these constraints in appropriately designed conditioning experiments will provide powerful tests of the ferromagnetic magnetoreception hypothesis.

The following papers were published In: R.W. Grigg and K.Y. Tanoue (editors), Proceedings of the Second Symposium on Resource Investigations in the Northwestern Hawaiian Islands, Vols. 1 and 2, May 25-27, 1983, University of Hawaii, Honolulu, Hawaii, UNIHI-SEAGRANT-MR-84-01.

Everson, A.R. 1984. Spawning and gonadal maturation of the ehu, *Etelis carbunculus*, in the Northwestern Hawaiian Islands, Vol. 2, pp. 128-148.

Ehu, Etelis carbunculus, ovaries were collected from various banks throughout the Northwestern Hawaiian Islands during 1977-81. Ovaries were microscopically examined to determine the most advanced developmental stage. Mean monthly gonadal somatic indices indicated that maturation began in May and spawning occurred from July to September. Ehu were found to be serial spawners, i.e., they spawned multiple batches of ova during the season. Most females spawned by the time they reached 35 to 40-cm fork length and older (>45 cm) fish were found to remain in spawning condition longer. The overall sex ratio in a pooled sample of 833 ehu was in favor of females by 2:1. Females also predominated in the larger size ranges (45 to 65 cm fork length) and during certain times of the year, indicating possibly that they live longer or aggregate during spawning. Fecundity of ehu 38.3 to 50.8 cm was estimated at 349,500 to 1,325,600 ova.

Hida, T.S. 1984. Pelagic fisheries resources of the Northwestern Hawaiian Islands. Vol. 1, pp. 328-338.

Included in this paper are reviews of data collected by the Hawaii Division of Aquatic Resources on the fish catch in the Northwestern Hawaiian Islands (NWHI) by longlining and trolling in recent years, the relatively new fishery for albacore, Thunnus alalunga, in the vicinity of the NWHI that is being carried out by U.S. West Coast albacore trollers, and some of the longline, live-bait, and gill net fisheries that are being carried out by Japanese and Taiwan vessels in the North Pacific Ocean.

Humphreys, R.L., Jr., and S.H. Kramer. 1984. Ciguatera and the feeding of greater amberjack, Seriola dumerili, in the Hawaiian Archipelago, Vol. 2, pp. 237-264.

Stomach contents collected from those greater amberjack, Seriola dumerili, tested for ciguatoxicity, were (1) examined to determine whether a relationship exists between feeding habits and incidence of toxicity, and (2) analyzed to determine the extent of geographic variability in the diet. Amberjack were classified into two weight groups. Large fish caught in the main Hawaiian Islands fed predominantly on Decapterus regardless of their level of ciguatoxicity. For small amberjack, Decapterus [sic] again predominated in the diet with these exceptions: those determined as being ciguatoxic and those caught in the Northwestern Hawaiian Islands. These two groups, plus the large nonciguatoxic amberjack of the Northwestern Hawaiian Islands fed more on bottom-associated fauna than all other groups studied. A series of hypotheses were generated from these results to explain the observed dietary differences.

Humphreys, R.L., Jr., D.T. Tagami, and M.P. Seki. 1984. Seamount fishery resources within the southern Emperor-northern Hawaiian Ridge area, Vol. 1, pp. 283-327.

The summits of the seamounts comprising the southern Emperor Seamount Chain and northern Hawaiian Ridge (Koko-Hancock Seamounts) lie at depths of 250 to 400 m; Russian data indicate that the topography produces much surface current meandering and upwelling in the region. In 1967, Soviet trawl fishermen discovered vast quantities of pelagic armorhead, Pentaceros richardsoni, and to a lesser extent alfonsin, Beryx splendens, closely associated with summits of these seamounts. Two years later, Japanese trawlers entered the fishery. They achieved their highest annual catch per unit of effort in 1972 with a sharp decline after 1976. With the advent of the 200-mile U.S. fishery conservation zone, the Hancock Seamounts came under U.S. jurisdiction. Comparison of the U.S. foreign observer data obtained on Japanese trawlers in 1978-82 with earlier Japanese data show trawl catches on Hancock have generally been declining since the high catch of 1972. Seamounts of the Hawaiian Ridge located south of Hancock and east of 180° latitude differ in having shallower summits, higher summit water temperatures, and fish faunas dominated by subtropical reef and snapper-grouper species. Meristic and electrophoretic work on pelagic armorhead indicates the existence of one stock inhabiting the range of seamounts between Koko and Hancock. Morphological variation among pelagic armorhead is little understood.

Ito, B.M., R.N. Uchida, L.K. Shirai, M.A. Abad, L.H. Kimura, and Y. Hokama. 1984. Radioimmunoassay results of ciguatera analysis of fishes in the Northwestern Hawaiian Islands, 1980-81, Vol. 2, pp. 226-236.

As part of the Northwestern Hawaiian Islands (NWHI) survey and assessment investigation, tissues of various nearshore and offshore fish species were analyzed by radioimmunoassay (RIA) to evaluate the distribution of ciguatoxic fishes. From 1980 through 1981, the Honolulu Laboratory of the Southwest Fisheries Center, National Marine Fisheries Service (NMFS), sampled 43 different offshore species for a total of 1,831 tissue samples. A total of 962 samples representing 76 different nearshore species were collected by the Division of Aquatic Resources (DAR) of the Hawaii Department of Land and Natural Resources from 1980 through 1982. When analyzed by the RIA method, 2,292 (82%) of the samples from NMFS and DAR were negative, 278 (10%) were borderline, and 223 (8%) were positive. The results were similar to those of the 1977-79 surveys and show that commercially valuable species, especially those in the snapper-grouper complex from various NWHI locations, had moderate to high frequencies of borderline and positive RIA results. Of the nearshore species, Chelinus unifasciatus (= C. rhodochrous) had the highest rejection rate (percentage of samples with RIA borderline and positive results). Although not previously implicated in ciguatera, Pontinus macrocephalus had the highest rejection rate among the offshore species, followed by Epinephelus quernus. Recent studies suggest

that species having high rejection rates and not previously implicated in ciguatera may contain polyether compounds which are similar in chemical reactivity to ciguatoxin but of lower toxicity.

Kikkawa, B.S. 1984. Maturation, spawning, and fecundity of opakapaka, Pristipomoides filamentosus, in the Northwestern Hawaiian Islands, Vol. 2, pp. 149-160.

The reproductive biology of opakapaka, Pristipomoides filamentosus, from the Northwestern Hawaiian Islands was studied. Development of ova within the paired ovaries was heterogeneous, and the stages of maturation, based on the development of ova in the most advanced mode in ova diameter size-frequency distributions, were positively related to the gonadal somatic indices. The data indicated that the spawning season for opakapaka is from June through December, with spawning peaks in August. Fork length appeared to be the best predictor of fecundity. Estimates of annual fecundity ranged from 477,990 ova for a 48.7 cm fish to 1,461,875 ova for a 76.3 cm fish. The species reaches sexual maturity at about 42.5 cm and spawns at 52 cm. The sex ratio (data pooled by years) showed a significant departure from 1:1. More males were observed in January and more females in August. Females predominated in the samples at sizes >70 cm.

Kikkawa, B.S., and A.R. Everson. 1984. Gonadal maturation, fecundity, and spawning of the greater amberjack, Seriola dumerili (Risso), in Hawaiian waters with references to ciguatoxin incidences, Vol. 2, pp. 161-178.

Reproductive biology of the greater amberjack, Seriola dumerili, was investigated to determine relationships with the irregular occurrence of ciguatoxic fish in Hawaiian waters. Incidence of toxic fish was independent of ovary maturity and spawning season. The spawning season is from February through June and peaks in March and April. Incidental spawning occurs year-round. Amberjack appears to be an intermittent spawner with three to four major spawnings in the relatively long protracted spawning season. Size at first maturity was 72 cm fork length and ripe ovaries were first observed in fish 78 cm long. Estimates of fecundity ranged from 1.3 t

1.09:1 (males to females); males predominated among fish 60 to 79 cm in length and females among fish 100 cm in length.

Paul, L.M.B. 1984. Investigations into escape vent effectiveness and ghost fishing in captive populations of the spiny lobster, Panulirus marginatus, Vol. 2, pp. 283-295.

The spiny lobster, Panulirus marginatus, comprises one of the major fishery resources of the Hawaiian Archipelago. It is

usually captured with a double-chambered wire trap whose mesh size is unregulated. Sublegal lobsters fully recruited into the fishery and caught in traps are sorted on deck. Deck sorting is time-consuming for the fisherman and frequently damaging to the lobsters, and its value as a stock conservation method is now being questioned. This study was designed to determine if spiny lobsters can be effectively "sorted" on the bottom by fishing with traps equipped with escape vents. This study also investigated whether lobsters would enter traps "baited" only with live lobster and thus be subject to ghost fishing. Three types of escape vents, single, bar, and mesh, were tested. The unbaited, vented traps were loaded with individually identified lobsters and left on the bottom of a large tank overnight. Results indicated that the overall escape rate of sublegal lobsters was approximately 60% with the escape rate decreasing linearly with increasing carapace length. There was no significant difference in escape rate between males and females. Differences in escape rates between vent types indicated that escape vent effectiveness may depend on total vent area. Since vented traps are able to sort out sublegal lobsters on the bottom, it is recommended either that traps be equipped with escape vents or that a minimum mesh size be required. In all the escape vent trials, ghost fishing did occur. Seven percent of the unloaded females and 9% of the unloaded males in the tank population were attracted to the vented traps baited only with live lobsters. It is recommended that lobster trap lids be fastened with biodegradable material. If not, lost traps should be included as part of total fishing effort until their estimated time of deterioration.

Polovina, J.J. 1984. ECOPATH - An ecosystem model applied to French Frigate Shoals, Vol. 1, pp. 375-398.

A simple model to estimate mean annual biomass, production, and consumption for components of an ecosystem is presented. The approach partitions the ecosystem into groups of similar species and requires estimates for these species groups of production to biomass, diet, and food consumption.

The approach was applied to an ecosystem at French Frigate Shoals in the Northwestern Hawaiian Islands where field work provided estimates of some of the input parameters as well as estimates of mean annual biomass and production, for some of the species groups modeled, to validate the estimates generated by the model. Simplified, the model depicts an ecosystem composed of four major trophic levels. The primary production consists of benthic algae and phytoplankton, the second level is composed of zooplankton and heterotrophic benthos, the third level consists of reef fishes, lobsters, crabs, bottomfishes, and small pelagic species including squid, flyingfish, akule, and opelu, and the top trophic level is composed of sharks, jacks, tunas, seabirds, and monk seals.

Simple sensitivity analysis was performed to measure the sensitivity of the estimates of the model to errors or uncertainties in the input parameters.

Ralston, S. 1984. Biological constraints on production and related management issues in the Hawaiian deepsea handline fishery, Vol. 1, pp. 248-264.

Specifically designed to gather data and information to meet the management needs of the Hawaiian deepsea handline fishery for demersal bottomfishes, a Sea Grant project (NI/R-7) was undertaken from 1976 to 1981. The resource in the main Hawaiian islands was assessed by surplus-production and yield-per-recruit methods to identify the extent of recruitment and/or growth overfishing. The former analysis revealed that around the Maui-Lanai-Kahoolawe-Molokai (MLKM) bank, the main producer in the state, fishing activity is excessive relative to obtaining a maximum in sustained yield (MSY). The latter treatment demonstrated that at Penguin Bank an optimal level of fishing mortality is in effect for maximizing the growth potential of opakapaka, Pristipomoides filamentosus. These two assessments are consistent with the literature where it has been shown that MSY fishing mortality is generally restricted to values less than that which maximizes yield per recruit. In contrast with the main islands, the bottomfish resource of the Northwestern Hawaiian Islands is underutilized at present, where it is estimated that an annual harvest of at least 330 metric tons (MT) with an ex-vessel value of \$2 million may be taken.

Seki, M.P. 1984. The food and feeding habits of the grouper, Epinephelus quernus, Seale 1901, in the Northwestern Hawaiian Islands, Vol. 2, pp. 179-191.

Sixty-seven stomach and spew samples of the grouper, Epinephelus quernus, from the Northwestern Hawaiian Islands were examined. The study showed that this grouper forages mainly on bottom-associated crustaceans, fishes, and cephalopods.

Shrimp (predominantly of the family Pandalidae) were the most important food item as determined by an index of relative importance (IRI). The IRI incorporates numbers and volumes of the prey and their frequency of occurrence. Of the 22 families of fishes that were represented in the food samples, members of the families Lutjanidae, Emmelichthyidae, and Congridae were the most important. The results suggest that E. quernus is a carnivorous, opportunistic bottom feeder.

Seki, M.P. 1984. The food and feeding habits of the white trevally, Pseudocaranx dentex (Bloch and Schneider 1801), in the Northwestern Hawaiian Islands, Vol. 2, pp. 192-208.

Sixty-four stomach samples of the white trevally, Psuedocaranx [sic] dentex, caught in the Northwestern Hawaiian Islands were examined to quantitatively determine the items which comprise the diet of this commercially valuable food species.

The results indicated that the white trevally is an opportunistic carnivore. It is primarily piscivorous, although cephalopods and crustaceans are also major contributors to the diet. The findings also strongly indicate that white trevally feeds near the bottom in the deeper waters offshore.

An index of relative importance (IRI) was computed to indicate which forage items were most important to the predators sampled. The IRI incorporates the frequency of occurrence and the percentage in the number and volume of the prey. The IRI showed that members of the families Congridae, Priacanthidae, and Serranidae were the most important fish prey. Cephalopods, crabs, and shrimp had the highest IRI among the invertebrates.

Shomura, R.S. 1984. Introduction, Vol. 1, pp. 5-6.

_____. 1984. [Panel Discussion.] Optimum use scenarios, Vol. 2, pp. 36-41.

Uchida, R.N., and D.T. Tagami. 1984. Biology, distribution, population structure, and pre-exploitation abundance of spiny lobster, Panulirus marginatus (Quoy and Gaimard 1825), in the Northwestern Hawaiian Islands, Vol. 1, pp. 157-198.

This overview incorporates results of studies conducted on the spiny lobster, Panulirus marginatus (Quoy and Gaimard 1825), resource in the Northwestern Hawaiian Islands by the Honolulu Laboratory from October 1976 to September 1981. Of 26 sites surveyed, only Necker Island and Maro reef appeared to have sufficiently large stocks for commercial exploitation. Included also are data on historical catches and fishery development, and results of analyses on geographic and depth distributions, pre-exploitation abundance, size composition, sex ratio, size at maturity, reproduction, behavior, and morphometry. Extrapolation of results from the assessment of the stock at Necker Island provided estimates of the maximum sustainable yield of spiny lobster for the entire Northwestern Hawaiian Islands. Discussions on economics, fishery potential, and management guidelines are also presented.

Uchiyama, J.H., S.H. Kuba, and D.T. Tagami. 1984. Length-weight and standard length-fork length relationships of deepsea handline fishes of the Northwestern Hawaiian Islands, Vol. 2, pp. 209-225.

Predictive and functional length-weight and standard length-fork (or total) length relationships were calculated from lengths and

weights of eight major deepsea species caught by handline in the Northwestern Hawaiian Islands (NWHI). Data collected on R/V Townsend Cromwell cruises from August 1978 to September 1981 were grouped by sex, cruise, and location of capture. Differences in slopes of regression lines between sexes, tested by ANCOVA for six species, were not significant. There were, however, significant differences among cruises for Epinephelus quernus and Pristipomoides filamentosus, the two most important species in the handline fishery. Among locations, differences in slopes were also not significant except for E. quernus. Pooling of data to calculate a single relationship representative of the whole population for each species, regardless of sex, cruise, or location of capture appeared justified. In this paper, length-weight relationships are given for eight major deep sea species caught by handline in the NWHI. These data represent conversion factors that should prove to be useful in the development of fishery management plans for the Hawaiian handline fishery.

Uchiyama, J.H., and D.T. Tagami. 1984. Life history, distribution, and abundance of bottomfishes in the Northwestern Hawaiian Islands, Vol. 1, pp. 229-247.

Relative apparent abundance of the eight most important bottomfish species was examined for the major banks of the Northwestern Hawaiian Islands. Most noteworthy was the dominance of Pristipomoides filamentosus at Necker Bank, French Frigate Shoals, and Brooks Banks and of Etelis carbunculus northwest of Lisianski Bank. In general, catch rates and mean sizes increased at the northwestern end of the archipelago. Research on age and growth, length-weight relationships, reproductive biology, feeding habits, and the occurrence of ciguatoxin in bottomfishes were also reviewed.

Published Abstracts only In: R.W. Grigg and K.Y. Tanoue (editors), Proceedings of the Second Symposium on Resource Investigations in the Northwestern Hawaiian Islands. Vols. 1 and 2, May 25-27, 1983, University of Hawaii, Honolulu, Hawaii, UNIHI-SEAGRANT-MR-84-01.

Alcorn, D.J. 1984. The Hawaiian monk seal on Laysan Island: 1982. Vol. 2, pp. 315.

Alcorn, D.J., and A.K.H. Kam. 1984. First observation of a fatal shark attack on a Hawaiian monk seal. Vol. 2, pp. 340.

Balazs, G.H. 1984. Growth rates of immature green turtles in the Hawaiian Archipelago. Vol. 2, pp. 318.

_____. 1984. Population status and ecology of the green turtle in the Northwestern Hawaiian Islands. Vol. 1, pp. 97-98.

- _____. 1984. Recovery records of adult green turtles observed or originally tagged at French Frigate Shoals, Northwestern Hawaiian Islands. Vol. 2, pp. 319.
- _____. 1984. Status of sea turtles in the central Pacific Ocean. Vol. 2, pp. 320.
- _____. 1984. Synopsis of biological data on the green turtle in the Hawaiian Islands. Vol. 2, pp. 321.
- Balazs, G.H., and G.C. Whittow. 1984. Revised bibliography of the Hawaiian monk seal Monachus schauinslandi Matschie 1905. Vol. 2, pp. 316.
- Dizon, A.E., and G.H. Balazs. 1984. Radio telemetry of Hawaiian green turtles at their breeding colony. Vol. 2, pp. 322.
- Gilmartin, W.G. 1984. Recovery plan for the Hawaiian monk seal, Monachus schauinslandi. Vol. 2, pp. 339.
- Gooding, R.M. 1984. Trapping surveys for the deepwater caridean shrimps, Heterocarpus laevigatus and H. ensifer, in the Northwestern Hawaiian Islands. Vol. 2, pp. 350.
- Harrison, C.S., T.S. Hida, and M.P. Seki. 1984. Hawaiian seabird feeding ecology. Vol. 2, pp. 311.
- Henderson, J.R. 1984. Encounters of Hawaiian monk seals with fishing gear at Lisianski Island, 1982. Vol. 2, pp. 337.
- Henderson, J.R., and W.G. Gilmartin. 1984. The Hawaiian monk seal: A synopsis of research. Vol. 1, pp. 95-96.
- Henderson, J.R., and T.C. Johanos. 1984. Effects of tagging on monk seal pups: Preliminary results. Vol. 2, pp. 338.
- Honda, V.A. 1984. Fecundity of the spiny lobster, Panulirus marginatus (Quoy and Gaimard), in the Northwestern Hawaiian Islands. Vol. 2, pp. 344.
- Ittner, R. 1984. The Hawaiian monk seal, Monachus schauinslandi, at French Frigate Shoals, 1982. Vol. 2, pp. 341.
- Kramer, S.H. 1984. Food and feeding habits of the wahoo, Acanthocybium solandri, in the Northwestern Hawaiian Island waters. Vol. 2, pp. 348.
- Prescott, J.H. 1984. Determination of size at maturity in the Hawaiian spiny lobster, Panulirus marginatus, from changes in relative growth. Vol. 2, pp. 345.

- Schlexer, F.V. 1984. Diving patterns of the Hawaiian monk seal, Monachus schauinslandi, Lisianski Island, 1982. Vol. 2, pp. 311.
- Shiota, P.M., and R.N. Uchida. 1984. Current trends in Hawaiian fisheries. Vol. 2, pp. 352.
- Stone, S.H. 1984. Hawaiian monk seal population research, Lisianski Island, 1982. Vol. 2, pp. 342.
- Uchida, R.N., and D.T. Tagami. 1984. Groundfish fisheries and research in the vicinity of seamounts in the North Pacific Ocean. Vol. 2, pp. 351.
- Uchida, R.N., and J.H. Uchiyama. 1984. Fishery atlas of the Northwestern Hawaiian Islands. Vol. 2, pp. 353.
- Watson, R.T., and G.A. Peiterson. 1984. Scat and spews analysis of the Hawaiian monk seal, Monachus schauinslandi. Vol. 2, pp. 343.
- Whittow, G.C., and G.H. Balazs. 1984. Basking behavior of the Hawaiian green turtle, (Chelonia mydas). Vol. 2, pp. 323.
- _____. 1984. The thermal biology of Hawaiian basking green turtles (Chelonia mydas). Vol. 2, pp. 324.

The following papers were presented at the Proceedings of the Conference on Cetacean Reproduction: Estimating Parameters for Stock Assessment and Management. In: Reports of the International Whaling Commission (Special Issue 6). W.F. Perrin, R.L. Brownell, Jr., and D.P. DeMaster (eds.), Reproduction in whales, dolphins and porpoises.

- Barlow, J. 1984. Reproductive seasonality in pelagic dolphins (Stenella spp.): implications for measuring rates, pp. 191-198.

This paper examines the patterns of reproductive seasonality in two species of dolphin in the eastern tropical Pacific: Stenella attenuata and S. longirostris. These are the principal species used by tuna purse seiners in locating schools of yellowfin tuna in this area. Birthdate distributions are calculated from the lengths-at-capture of fetuses and calves killed in fishing operations, the dates of capture, and the estimated growth curves for these species. Although births were found to occur at all times of the year, distinct modes could be seen in the distributions. Geographic differences in patterns of seasonality could be distinguished on the basis of the strength of the observed modes, the number of modes, and their timing. The northern stock of S. attenuata has a diffuse bimodal pattern in annual reproduction with peaks in spring and autumn. The southern stock of this species has a strong unimodal pattern whose timing

corresponds to the spring peak in the northern stock. The eastern spinner form of S. longirostris also has a single annual peak in reproduction between March and June, with regional differences in the timing of this mode. The whitebelly spinner form of S. longirostris shows a bimodal pattern with peaks in spring and autumn. These seasonal patterns in reproduction can affect reproductive rate measurements by changing our concept of stock boundaries or by introducing biases due to time of sampling. If the mating season is short, this can also limit the rate at which females can be inseminated after an aborted pregnancy, calf death, or weaning.

DeMaster, D.P. 1984. Review of techniques used to estimate the average age at attainment of sexual maturity in marine mammals pp. 175-179.

The average age of sexual maturation (ASM) is generally used as a "K" index to determine whether or not a population is approaching its carrying capacity. If the ASM is increasing, it is inferred that the density per capita of resources is increasing and that density-dependent mechanisms are operative. At least five techniques are commonly used to estimate the ASM. These techniques are mean of known-age first-time ovulators, mean deduced from age-specific ovulation rates, regression of age-specific ovulation rates versus age, graphical interpretation of age when 50% of animals have ovulated, and graphical interpretation of age at which the cumulative probability of ovulation equals the cumulative probability of not ovulating. Using hypothetical data, it is shown that different techniques produce different estimates of the ASM. The mean of known-age first-time ovulators is assumed to be the best estimator of the ASM, and other techniques are compared for bias and precision.

Myrick, A.C., Jr. 1984. Reproductive seasonality in multi-herd groups of northern offshore spotted dolphins, Stenella attenuata, and age-related reproductive parameters for females, pp. 480.

Tooth dentine of spotted dolphins contains annual growth layer groups (GLGs) which consist of about 13 lunar monthly layers (LMLs) each. LMLs were counted in teeth from approximately 300 males and females less than five years old. Back calculations of LMLs from the data of death obtained the approximate month of birth (+ 1 month). Most animals killed in a given purse-seine set or in a series of sets made in a given area over a few days were born either in the same month or about six months later. Animals taken in other sets at a different position and date were born in a different month or six months later. The implications of these findings are (1) that spotted dolphins may maintain discrete multi-herd breeding groups comprised of ephemeral herds and confined to rather small geographic ranges, and (2) nonpregnant females may have an obligatory ovulation rate of twice per year.

Perrin, W.F., and G.P. Donovan. 1984. Report of the Workshop, pp. 1-24.

Perrin, W.F. and J.R. Henderson. 1984. Growth and reproductive rates in two populations of spinner dolphins, Stenella longirostris, with different histories of exploitation, pp. 417-430.

A model of density-dependent change in net reproductive rate (births minus deaths) has been used in assessing status of dolphin stocks in the eastern tropical Pacific. The eastern spinner population has been estimated to be at a lower fraction of original size (17-25%) than is the population of whitebelly spinners (58-72%). Higher reproductive rates would be expected in the former than in the latter on the basis of the density-dependent model, provided the latter is above its level of maximum net production. Based on analyses of over 4,000 specimens collected through 1978: (1) there is a relative paucity of fully adult males in the eastern spinner population (possibly resulting in lower average fertility), (2) the eastern spinner female attains sexual maturity about one tooth-layer unit (probably one year) earlier than does the whitebelly spinner, (3) ovulation rate in young females is lower in the eastern spinner population, and (4) the proportion of all females which are sexually mature is lower in the eastern spinner population. Gross annual reproductive rates (proportion female x proportion of females mature x pregnancy rate) are not different in the two populations (about 8-10% in both cases). This comparison does not confirm the hypothesis that a density-dependent increase in gross reproduction occurs in the spinner dolphin.

Perrin, W.F. and S.B. Reilly. 1984. Reproductive parameters of dolphins and small whales of the family Delphinidae, pp. 97-133.

The purposes of this review are to describe and critique methods used to estimate reproductive parameters, to summarize estimates in the literature and to examine patterns in the estimates and their implications. Reviewed are gestation period, fetal growth rate, size at birth, size and age at attainment of sexual maturity, average size and age of adults, maximum size, asymptotic length, ovulation rate, pregnancy rate, calving interval, length of lactation, weaning age, length of "resting" period, age and sex structure, and birth rates. Also discussed are the effects on the estimates of seasonality, schooling segregation, geographical variation and exploitation and the relationships between parameters.

Perryman, W.L., M.D. Scott, and P.S. Hammond. 1984. A technique for estimating reproductive parameters of small cetaceans from vertical aerial photographs, pp. 482.

An aerial photographic survey was conducted off the west coast of Mexico to acquire length-frequency data on dolphin stocks affected

by the tuna purse-seine fishery in the eastern tropical Pacific. This study was funded by the Inter-American Tropical Tuna Commission (IATTC), and the scientific party was comprised of personnel from the IATTC and the National Marine Fisheries Service (NMFS). The study was designed to develop and evaluate techniques for photographing dolphin schools, measuring lengths of dolphin images from aerial photographs, and using these data for calculating reproductive parameters. The camera systems onboard included a 230 mm format cartographic camera, two 115 mm format aerial reconnaissance cameras, and four Hasselblad 55 mm format cameras. The camera systems were mounted vertically in the deck of an AT-11 aircraft. Although all of these camera systems have been used successfully to collect imagery for length determination of large cetaceans, only the 115 mm format cameras produced photographs of adequate quality for dolphin length measurements. Of the 100 schools photographed, 29 were of suitable quality for length-measurement analysis. Due to their light grey color and unique swimming behavior, spinner dolphins (*Stenella longirostris*) were found to be more vulnerable to photographic sampling than the other species encountered. Preliminary analyses of some length data from schools of the Costa Rican race of spinner dolphins have revealed that groups of lengths of small animals can be identified which correspond to age groups approximately 6 months apart up to an age of 1-1/2 - 2 years. Analyses are proposed to try to describe the data using a limited age-structured model from which estimates of reproductive rate can be obtained.

Polacheck, T. 1984. Reproductive estimates of a source of information on survival rates, pp. 181-185.

A method of estimating the survival rates and net rates of population increase is based on estimates of the proportion of animals which are mature, the average age at attainment of sexual maturity, and the adult fecundity rate. The method is most useful for exploring the ranges of survival rates that are consistent with the estimates of these parameters. Several assumptions are necessary to obtain survival-rate estimates, including constancy of survival and fecundity rates and a stable age distribution. The method is applied to data from three dolphin populations in the eastern tropical Pacific. These data are not consistent with a positive net rate of population increase, but several possible sampling biases exist for the data and must be investigated.

Reilly, S.B. 1984. Observed and maximum rates of increase in gray whales, Eschrichtius robustus, pp. 389-399.

Shore-station censuses indicate that the California stock of gray whales increased at an annual rate of 2.5% during 1967-1980, concurrent with an annual exploitation of approximately 1.2%, i.e., net reproduction was near 3.7% per year. In light of this net reproduction, vital-rate estimates for the circa 1967 population were re-evaluated. The most likely values during that

period were: pregnancy rate of 0.467, mean age at sexual maturity of 8 years, adult survival of 0.945 and juvenile survival of 0.899. To estimate maximum net rate of increase, biologically defined limits of pregnancy rate, age at sexual maturation and juvenile survival were used to generate a Leslie matrix, with adult survival held constant at the 1967 level. The dominant eigenvalue of the matrix was calculated as 1.069. If a stable age structure can be assumed in populations at a very low level, this indicates a possible maximum net rate of increase approaching 6.7% per year.

Smith, T.D. 1984. Estimating the dolphin population size yielding maximum net production, pp. 187-190.

A method is presented for estimating maximum net productivity level by comparing gross reproductive rates in three populations at different proportions of original size.

Approved by Center Director

Ad, David W.R. and Wayne L. Perryman. Dolphin habitats in the eastern tropical Pacific. For consideration for publication in Fishery Bulletin, U.S.

Lenarz, William H. A double sampling procedure for estimation of age composition of fish landings. For consideration for publication in Biometrics.

Mackett, David J. Strategic planning for research and management of the albacore tuna fishery. For publication in Systems Research.

Matsumoto, Walter M. Potential impact of deep seabed mining on the larvae of tunas and billfishes. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-44.

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Uchiyama, James H., Ray K. Burch, and Sidney A. Kraul. Growth of dolphins, Coryphaena hippurus and C. equiselis, in Hawaiian waters as determined by daily increments on otoliths. Fishery Bulletin, U.S.

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Takenaka, B., L. Torricer, J.C. Cooper, and S.G. Pooley. 1984. Trends in the market for mahimahi and ono in Hawaii. Southwest Fish. Cent. Admin. Rep. H-84-9.

Wetherall, J.A., and M.Y.Y. Yong. 1984. Assessment of the South Pacific albacore stock based on changes in catch rates of Taiwanese longliners and estimates of total annual yield from 1964 through 1982. Southwest Fish. Cent. Admin. Rep. H-84-11.

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Iguchi, Kenichi. 1973. Research by trawl fishery for commercialization in the central North Pacific Ocean--II. Bull. Jpn. Soc. Fish. Oceanogr. 23:47-56. (Engl. transl. by T. Otsu, 1984, 12 p., Transl. No. 96; available Southwest Fish. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96812.)

HONOLULU LABORATORY

Honolulu, Hawaii

Insular Resources Investigation

Intensive Bottom Fishing Experiment Analyzed

Dr. Jeffrey J. Polovina, Leader, Resource Assessment Investigation of the Mariana Archipelago Program, reports that the analysis of the intensive bottom fishing experiment at Pathfinder Reef in the Marianas shows a behavioral interaction between two species of bottom fishes, Pristipomoides zonatus and P. auricilla. When the catch-per-unit of effort (CPUE) data of both species were examined, it was observed that the CPUE of P. zonatus decreased during the 13-day intensive fishing experiment while the CPUE of P. auricilla increased. The Leslie Model was applied to the data.

For P. auricilla where CPUE increases as cumulative catch increases, the Leslie Model does not make sense biologically. However, under the hypothesis that catchability for P. auricilla is not constant but is expressed as a power function of the population size of a competitive species, P. zonatus, a new multispecies Leslie Model was developed.

In this multispecies Leslie Model, the catchability for P. auricilla increases as the abundance of its competitor, P. zonatus, decreases. This model fits the P. auricilla CPUE data very well and explains the increasing CPUE trend.

The assessment and management implication of the finding that catchability may depend on species interactions is that CPUE data in a multispecies stock may not be an accurate measure of relative abundance.

Fishery Management Research Program

Improvements Made in Data Collection and Management Systems

David C. Hamm, Computer Systems Analyst, traveled to Guam to work on the Western Pacific Fishery Information Network (WPACFIN) with personnel from the Guam Division of Aquatic and Wildlife Resources (DAWR) and the Commonwealth of the Northern Mariana Islands Division of Fish and Wildlife (DFW). Hamm installed a 20MB Corvus hard disk system and a second Apple II+ Microcomputer at the DAWR office and provided instructions on the use and maintenance of the new equipment, which will increase the efficiency of data processing and facilitate more timely processing of data. It will also permit an increase in the amount of data that can be analyzed. Hamm also reviewed the Guam offshore expansion system software and documentation with DAWR and DFW personnel and discussed in detail the expansion system for the inshore surveys. The offshore survey data base for creel surveys in Saipan was designed and

implemented. The inshore and offshore data expansion systems for DFW will be similar to those being developed for Guam.

Hamm also met with members of industry in Guam to discuss improvements in data collection activities for the major fish wholesalers. Significant progress was made and two other major wholesalers were added to the list. The DAWR will be acting as the liaison between WPACFIN and the Guam wholesalers for the next few months to help the wholesalers implement improved data collection and transfer activities. Both wholesalers provided recent historical data for the Guam commercial landings data bases, which are maintained in WPACFIN. Hamm and DAWR personnel discussed additional improvements to the commercial landings data bases.

Field Trials of Escape Gap Experiment in Progress

Samuel G. Pooley, Acting Leader, Fishery Management Research Program, reports that research assistants Alan R. Everson and Victor A. Honda are aboard the NOAA Ship Townsend Cromwell to conduct sea trials of experimental escape gaps in spiny lobster traps. The purpose of the sea trials is to confirm the results of shoreside tests conducted to reduce the number of sublegal spiny lobsters caught in traps. Early results of the sea trials confirm the escape rates estimated on the basis of the shoreside laboratory trials.

Data Gathering Phase of Economics Study Completed

Samuel Pooley reports that the final economic analysis of the Hawaii Longline and Handline Cost-Earning Study was received from the contractor which completes the data gathering portion of the project. Simple microcomputer spread sheet models of fishing vessel operations have been prepared to use the data collected from industry. Such "simulators" should provide fishery managers with information about the effect of fishery regulation and development activities on vessel economics.

* * * * *

Research assistant Nathaniel T. Shippen returned to Honolulu after serving several weeks as an observer on the Japanese stern trawler, Akebono Maru No. 31. The vessel fished for pelagic armorhead, Pentaceros richardsoni, on the Hancock Seamounts in the U.S. fishery conservation zone. Catch rates were poor.

* * * * *

Daniel R. Locey, NOAA Junior Fellow, completed contour plots of tuna longline statistics from the American Samoa longline fishery. The contour plots consist of data on catch, effort, and CPUE for 1982.

Pelagic Resources Investigation

Yellowfin Tuna Successfully Tracked for 48 Hours

Dr. Richard W. Brill, Leader, Experimental Ecology of Tuna Program, Dr. Kim Holland, Hawaii Institute of Marine Biology, University of Hawaii (UH), and Randolph K.C. Chang, Fishery Biologist, successfully tracked a yellowfin tuna, Thunnus albacares, tagged with an ultrasonic depth sensitive transmitter on the Laboratory's R/V Kahele'ale. The fish was tracked for 48 hours. This is the longest track obtained to date using the R/V Kahele'ale (the longest track previously had been 27 hours).

The 51 cm fish was caught in the immediate vicinity of fish aggregating device (FAD) "V" (located off the Waianae coast of Oahu) at about 0930 on June 29. The fish remained in the immediate vicinity of the FAD until after sunset when it moved away slowly. The fish made its way back to FAD "V" during the following morning and again spent the entire day in the immediate vicinity of the FAD. The fish again moved slowly inshore after sunset and made its way back to FAD "V" the following morning, arriving at the FAD at approximately 1000 on July 1. The track was terminated at that time because of crew fatigue.

Attempts were made to relocate the fish on July 2 and 3. All three FADs located off the Wainae coast were searched as well as the 91 m (50 fathom) isobath inshore of the FADs. Unfortunately, the yellowfin tuna was not relocated.

Detectable Odor Thresholds Determined for Yellowfin Tuna

Ruben Yost, UH Graduate Student, has completed tests on the minimal prey odor concentrations detectable by yellowfin tuna and the responses of yellowfin tuna to single amino acids. (Amino acids have been shown to be strong olfactory stimulants in other fish species.) Yellowfin tuna have responded to prey odor concentrations as low as 10^{-5} g/liter. Odors are made by freeze-drying rinses from tunas' natural prey species. Apparently, yellowfin tuna are able to detect compounds in the 10^{-7} molar range, which is as good or better than other teleosts. Yellowfin tuna have, surprisingly, exhibited almost no reactions to single amino acids.

Study of Lactate Metabolism in Tunas Continue

Dr. Peter Hochachka, University of British Columbia, Dr. Thomas Moon, Huntsman Marine Laboratory, and Dr. Bren Gannon, Flinders University, Australia, arrived at the Kewalo Research Facility to join Jean-Michele Weber, University of British Columbia, and Dr. Brill in a joint continuing study of lactate metabolism and physiological reactions of tunas to strenuous exercise and other possible underlying causes for burnt tuna. The group is currently investigating lactate turnover rate, and gluconeogenesis (conversion of lactate to glucose) in the various organs of skipjack tuna, Katsuwonus pelamis, and they are investigating the possibility that tunas' vascular countercurrent heat exchangers may act as lactate exchange systems for rapidly moving large quantities of lactate from the white muscle, where it is produced, to the red muscle, where it is metabolized.

Dr. Gannon, a specialist in the study of microvascular anatomy, has successfully produced vascular casts of the central and lateral heat exchangers of skipjack tuna. The objective of this research is to provide anatomical evidence to support the hypothesis of the countercurrent vascular exchange of lactates.

* * * * *

Richard N. Uchida, Acting Chief, Pelagic Resources Investigation, continued work on the first draft of a background document on major net fisheries of the North Pacific for the workshop on Fate and Impact of Marine Debris. Uchida also reviewed the final draft report on the potential impact of ocean thermal energy conversion on fisheries, and coordinated the Laboratory's response to requests for comments on "NOAA Habitat Alterations Policy Analysis," and Laboratory supported research in FY 1979-84 from the UH Sea Grant College Program for evaluation of fishery related policies and activities in the State of Hawaii.

COASTAL FISHERIES RESOURCES DIVISION

La Jolla, California

Coastal Eastern Pacific Population Biology of Fishes

Progress Made on Determining Growth in Fishes

Fishery biologist John Butler and biological assistant Susan Longinotti continue their work on determining the age and growth of anchovy and sardine. Longinotti has finished reading the otoliths from the 1983 year class. Butler and Longinotti report that 1983 anchovy recruits are smaller than in previous years. Recruits ranged in size from 45-95 mm, with 68 mm the average size. In previous years recruits collected at the same time of the year averaged 86 mm in 1980 and 78 mm in both 1981 and 1982, with strong modes in the 85-95 mm size class. During 1983 fish in the 85-95 mm size class are noticeably absent. The small size of the 1983 recruits may be due to a late spawn or due to reduced growth rates during 1983. The raw spawn data distribution (Figure 1) indicated that most of the 1983 year class were spawned during March and April. This corresponds to the normal peak spawning season of the northern anchovy. Thus the small size of 1983 recruits is not due to an abnormally late spawning. Butler has tested the hypothesis of reduced growth rates with an analysis of covariance using length, age and date of spawning. The null hypothesis was that size at age was the same for fish spawned in the months of January through May for the years 1980 to 1983. The analysis showed significant differences ($P=.01$) of size at age. The adjusted mean size at age 210 days for fish spawned during the months January through May for the years 1980 to 1983 are shown in Figure 2. Fish born during February, March and April of 1983 are smaller than fish from previous years. Small sample sizes obscure the interpretation of fish spawned during January and May.

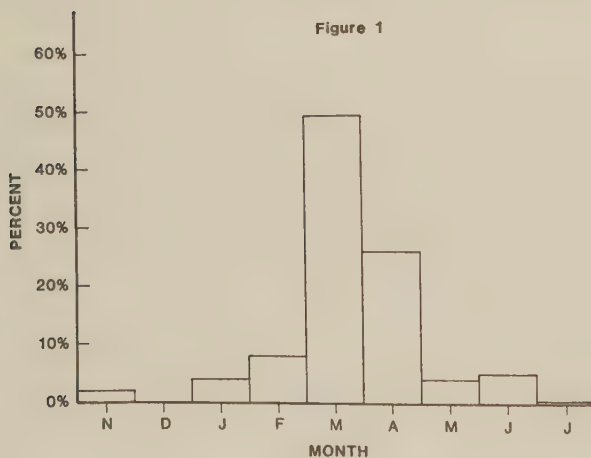


Figure 1. Spawn data distribution of 240 juveniles collected in October 1983.

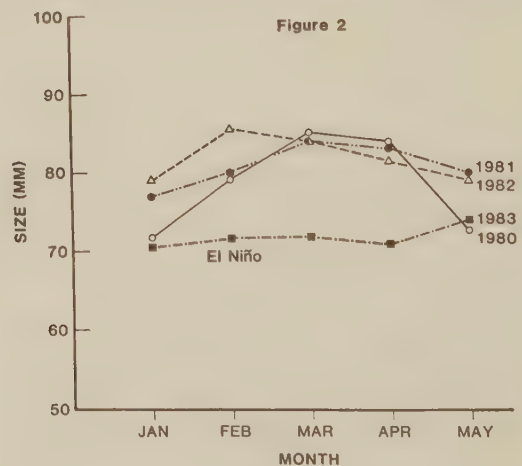


Figure 2. Mean length of fish spawned during January through May of 1980-1983 adjusted to age 210 days.

In a related study NOAA Junior Fellow Marlene Johnson completed analysis of the fat content of anchovy collected between September 27 and October 12, 1983. Fat content of 171 juvenile anchovy (46-109 mm) averaged $22.9 \pm 7.8\%$ of dry weight. In a previous study Lasker and Smith (1977) reported a fat content 38.9% of dry weight of adult anchovy collected at the same time of year. The lower fat content reported here may be due to effects of El Nino and also the smaller sized fish in the present study.

Blanca Rojas de Mendiola, IMARPE, Peru, continues to work on the age determination of sardine larvae from Peru. Mendiola has dissected and mounted otoliths from 120 larvae ranging in size from 7 to 22 mm. Together with otoliths from laboratory-reared California sardines she will determine the growth rate of sardine larvae. Mendiola and Butler have encountered some difficulties in reading larval sardine otoliths and will use electron microscopy to confirm the interpretation of some otoliths. Mendiola is also learning to read juvenile sardine otoliths from Butler.

Retention in Plankton Nets of Eggs and Larvae of Anchovy and Jack Mackerel Assessed

Two field experiments aboard the NOAA Ship Townsend Cromwell were conducted by mathematician Nancy Lo in April 1983 to estimate the retention in plankton nets of anchovy eggs and larvae and jack mackerel larvae, one major parameter for assessing egg and larval abundance.

In the first experiment, anchovy eggs and larvae were taken in 70 collections using Bongo nets with 0.505 mm and 0.333 mm mesh nets, in 20 collections using a 1 m ring net tows with 0.505 mm mesh and in 30 PAIROVET tows with 0.505 mm and 0.150 mm nets. Because of the small sample sizes of 1 m ring net and PAIROVETS, the estimates of the retention rates were not reliable and are not reported. However, the data on larvae taken in 1 m ring net were used to assess the day/night avoidance (evasion) of the net frame. For each tow, both eggs and larvae were counted and larvae were measured to the 0.5 mm. The catch ratio of eggs and larvae by length in 0.505 mm mesh net to those in 0.333 mm mesh net from Bongo tows from this experiment and the catch ratio of 0.333 mm and 0.150 mm from a previous experiment were used to compute the retention rate in 0.505 mm mesh.

In addition to the data collected from the 1983 mesh experiment described above, Lo also included data on eggs taken in routine CalCOFI surveys in 1980-1983 in cases where both Bongo and CalVET tows were taken at the same station (mesh size for CalVET frame was 0.333 mm prior to 1983, and 0.150 mm after 1983). The retention of eggs in plankton nets in tows taken from the 1980-1983 surveys were compared with the results of the 1983 mesh experiment.

The fraction of anchovy eggs retained in Bongo nets of 0.505 mm based upon the 1983 mesh experiment was $0.29 = 0.32 \times 0.91$ where 0.91 was the fraction for 0.333 mm mesh. The estimated retention of eggs by nets tows taken in regular surveys was quite different from the experiment results except for 1983 (Table 1).

Table 1. Sample mean catch of anchovy eggs per 0.05 m² in Bongo nets with 0.505 mm, 0.333 mm and 0.150 mm mesh size, the retention rates and the retention correction factor (RCF) for 1980-83 CalCOFI Surveys and 1983 mesh experiment. Standard errors are in parentheses.

(1) Year	(2) 0.505 mm	(3) 0.333 mm	(4) 0.150 mm	(5) no. of tows	(6) retention rate	(7) ² (6)x0.91	(8) RCF
1980-81	2.69 (0.38)	31.52 (5.32)		116	0.09	0.08	12.76 (2.56)
1982	3.1 (0.7)	15.0 (3.4)		41	0.21	0.19	5.28
1983	6.4 (3.0)		20.8 (6.55)	50		0.31 ³	3.23
1983	3.70 ¹ (32)	1172 ¹ (87)		70	0.32	0.29	3.46 (0.49)

¹Catch per Bongo tow.

²0.91 = retention rate of eggs in 0.333 mm mesh compared to 0.150 mm mesh for 1980-82 field data and 1983 experiment.

³(2)/(4).

⁴For 1980-83 CalCOFI survey; only tows with positive catch from at least one of the two nets.

The difference could be due to the differences in patchiness of eggs among years. If more Bongo tows had been taken in 1980-1983, the average number of eggs retained might have been closer to the results of the 1983 experiment. To test this hypothesis will require more than four years of data. Lo will continue to monitor the retention rates of anchovy eggs from the future surveys.

The retention rates of anchovy larvae from the 1983 experiment have verified the retention equation given in a 1983 report by Lo NOAA-TM-NMFS-SWFC-83-31 "Reestimation of three parameters associated with anchovy egg and larval abundance; Temperature dependent, incubation time, yolk-sac growth rate and egg and larval retention in mesh nets. Avoidance of net frame by larvae (as indicated by the ratio day to night larval catch) started at 6.0 mm S.L. for the Bongo catches and possibly 5.0 mm for the 1 m ring net catches which was suggested by Paul Smith (1981).

In the second field experiment, jack mackerel larvae were collected in 50 PAIROVET tows (0.150 and 0.333 mm mesh) and in 50 Bongo net tows (0.333 mm and 0.505 mm mesh). The length-specific ratio of catches of larvae taken in 0.333 mm mesh net to those taken in 0.150 mm mesh net (PAIROVET tows) and the ratio of numbers of larvae taken in 0.505 mm mesh relative to 0.333 mm mesh (Bongo tows) were used to compute the fraction of larvae retained in 0.505 mm mesh net. The fraction of larvae of jack mackerel retained in 0.505 mm mesh varies from 0.03 for 2.5 mm larvae, to 0.28 for 3.0 mm and the fraction approaches unity for larvae > 3.0 mm.

The relationship between retention of jack mackerel by nets and jack mackerel length was different from that of the anchovy. For jack mackerel, the retention rate was a jump function of length, whereas for anchovy, the retention rate was a smooth function of length (Figure 1). This was due to the difference in body depth of these two species.

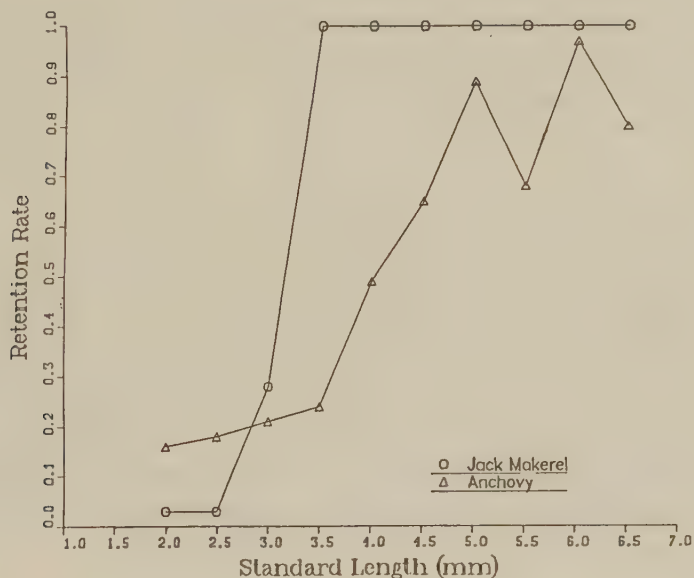


Figure 1. Fraction of larvae of jack mackerel and anchovy retained in 0.505 mm mesh.

Coastal Eastern Pacific Fisheries Environmental Investigations

1984 U.S. Albacore Fishery Has Early Start

Dr. R. Michael Laurs reports that the albacore fishing off Baja and southern California is off to a very early start this year for both sport boats and commercial boats. Sport boats began making catches in late May off northern Baja California and good catches were reported by commercial boats

beginning in early June. Fishing remained excellent off San Diego through July for both commercial boats and sport boats. Total landings at San Diego sport boat docks were 1,000 to 4,000 fish per day and fishermen averaged between 2 to 8 fish per day during most of July. During the last half of July good fishing was also reported by jigboats operating 900 to 1100 miles offshore of northern California. Fishing by boats operating in the central North Pacific since late spring months have had poor to moderate fishing success. The commercial landings through the end of July are estimated to be about 8,500 tons for California, and Hawaii, compared to the 1983 seasonal total of about 10,000 tons and the 1982 seasonal total of about 7,500 tons.

The 1984 albacore fishing season has the potential to be one of the best seasons in recent years. However, cannery closures and market conditions could limit the fishery as the season progresses. To offset the probable reduced amount of U.S. albacore for the canned market, a Pacific coastwide alternative marketing program of fresh and frozen albacore has been launched. The program is being funded by Saltonstall-Kennedy funds, administered by the NMFS Southwest Regional office in Terminal Island.

The SWFC albacore advisory operations this year include biweekly fishery bulletins which are distributed by mail and daily albacore fishing broadcasts. The daily broadcasts are being prepared by fishery biologist Ron Dotson and are transmitted by 2 government and 6 commercial radio stations along the Pacific coast.

Surface Thermal Gradients in the North Pacific Examined

Ron Lynn and Ken Bliss, Oceanographers, initiated a project to examine surface thermal gradients in the temperate North Pacific. The objective of this project is to test for a possible relationship between changes in the distribution of albacore catches and changes in the large-scale fronts. The gradients are calculated from monthly average sea surface temperatures (SST) by one degree squares of latitude and longitude. Since 1982, the SST data has been supplied by PEG through oceanographer Doug McLain. Earlier data had been archived from the La Jolla Laboratory's project. Five maps of thermal gradients have been completed for 1983. Monthly changes in the major zonal fronts are evident.

Bliss completed processing of the entire backlog of oceanographic (CTD cast) data taken aboard the R/V David Starr Jordan during the 1980-81 CalCOFI surveys. This effort brings the CalCOFI oceanographic data files up-to-date.

Unused Anchovy Spawning Range Observed in 1974

Dr. Paul Fiedler is examining satellite imagery for unusual oceanographic conditions to explain the unusual anchovy spawning range observed during the CalCOFI 8403 biomass survey in March 1984. This year's anomalies must be interpreted in light of the 1983 distribution, which was equally anomalous, but in a very different sense. In 1983 (an El Nino year) spawning extended farther offshore and to the north than during 1980-82. In 1984 (post-El Niño)

spawning again tended to be offshore, but while the northwestern limit at Santa Cruz and San Nicolas Islands was normal, there was a conspicuous gap in the spawning range within 50 km of the coast between San Diego and Ensenada, and virtually no spawning south of Ensenada. This change may involve a population response to the 1983 El Niño, which is having lingering effects in California coastal waters.

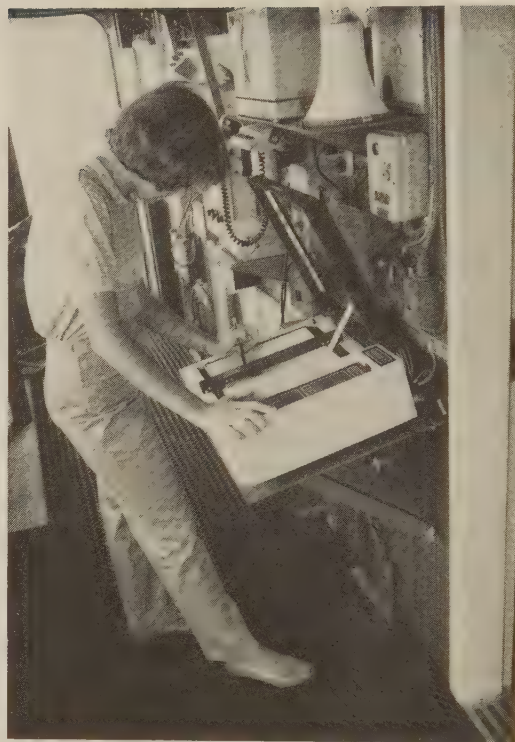
Survey Systems Development and Evaluation

First Field Test of Juvenile Sampling Procedure Slated

Quantitative surveys of the abundance of juvenile fish are hampered by the patchy distribution of these schooling fish. Statistical efficiency is low unless most of the sampling effort can be directed to the areas containing most of the fish. For example, juvenile anchovies were found by Ken Mais, California Department of Fish and Game, and Richard Methot to be concentrated in shallow water. For this reason, Mais and Methot have established a two-stage probability sampling procedure. The first stage is acoustic surveys of the habitat to locate fish concentrations. The second stage is trawl sampling of the fish concentrations. While the probability sampling procedure is straightforward, the record keeping for allocating the desired samples and documenting the sampling pattern achieved requires information on depth to the bottom, depth and range of the fish, and frequent positions of the ships while executing many and irregular changes of course.

Paul Smith, Richard Methot, and Celeste Santos have developed a system for real-time recording of the ship's position within the juvenile anchovy habitat. The first phase of the project was to digitize coastal navigational charts. The charts were digitized with the Textronix plotter and microcomputer; each chart covers a 20 minute x 20 minute quadrant and includes the 10, 50 and 100 fathom depth contours. These charts are set up to be placed on the plotter (C-plot attached to the LORAN navigtional unit). The ship's cruise track can then be recorded on the charts and sampling efforts and significant biological observations can be annotated on the same chart.

Charts in the vicinity of nearshore CalCOFI stations were taken by Methot and Santos (Figure 1) on the July 1984 CalCOFI cruise on the David Starr Jordan. The precision of the LORAN and C-plot was evaluated by recording the ship's progress from one CalCOFI station to the next. Major tests were conducted in the vicinities of Santa Cruz Island, Avila, Big Sur and Monterey. The Santa Cruz Island test was conducted at night and the trajectories of Isaacs-Kidd midwater trawl tows were recorded using the event marker on the C-plot. Ship movements within the 20 minute quadrants were recorded with sufficient precision to provide a useful record of the location of sampling activities in the quadrant. In the future a sonar data logger will be interfaced with a navigational logger similar to that described here. This equipment will allow daily decision making on the allocation of trawl sampling effort within each quadrant to achieve an efficient stratified sampling scheme.



Biological technician Celeste Santos at the plotter for the LORAN-C on the bridge of the David Starr Jordan.

Commercial and Recreational Fisheries Research for Management

Crab Fishery Management Reviewed

Dr. Richard Methot, Fishery Biologist, submitted a manuscript entitled "Management of Dungeness crab fisheries" to the Canadian Journal of Fisheries and Aquatic Science. The paper will be included in a special volume dedicated to the workshop on Stock Assessment and Management of Invertebrates which was held in Nanaimo, British Columbia, Canada, in May 1984.

Pacific Mackerel Abundance Index Calculated

Dr. Alec MacCall, with help from Cynthia Meyer and Richard Charter, calculated recent values of the aerial fish spotter index for Pacific mackerel in response to an outside request for information. The California Department of Fish and Game (CF&G) biomass estimates show a substantial decline in

abundance for the last few years, and trends in the aerial spotter index could provide corroborating evidence. The aerial index, developed by fishery biologist James Squire of the La Jolla Laboratory, is proportional to the average amount of fish sighted per statistical block flown over by commercial fishery spotter pilots. Squire's method of calculation was modified slightly so that the extraordinarily large concentrations of Pacific mackerel seen since 1978 could be more easily handled. The resulting aerial index values and comparative biomass estimates are:

Year	Aerial index	CF&G biomass (1000 tons)	Year	Aerial index	CF&G biomass (1000 tons)
1974	0.0	small	1979	8.18	250.4
1975	0.0	small	1980	9.32	214.6
1976	0.048	small	1981	4.58	244.9
1977	11.07	76.1	1982	2.95	211.1
1978	21.15	104.2	1983	2.20	127.9
			1984	n.a.	89-106

The aerial index shows the sudden increase in Pacific mackerel abundance in 1977-1978, but proportionality fails subsequently. Thus, the agreement in trend since 1981 is of questionable value. The reason for these discrepancies is not yet known, but possibly may be the result of changes in personnel. Different spotter pilots are known to differ systematically in the tonnages reported from the same schools.

Statistical Analysis of Aerial Fish Spotter Logbooks Initiated

Statistician Andy Bindman has begun an analysis of the aerial spotter logbook data to develop an index of relative abundance. He will be using an analysis of variance (ANOVA) model to assign variation among different sightings to known effects and to remove as much error as possible. Some of the effects under consideration are the result of different pilots, seasons, time of day, and year-to-year changes in population abundance. It is the last effect that will be used to develop the relative annual index of population abundance.

Statistician Receives Master of Science Degree

Andy Bindman, Statistician, completed his Master's thesis entitled, "An application of Andersen's method of extracting information from the stomach contents of fish", and it has been accepted by the University of Washington. The abstract of his thesis follows:

Andersen's method is a composite of several models of feeding biology which, when viewed together, provide a description of the stomach contents of a predator which has been feeding in an environment of known prey size distribution. This thesis applies the converse in order to estimate the prey size distribution in the environment when only the predator's stomach contents are available.

The method is applied to a data set of Pacific cod (Gadus macrocephalis) stomach contents. A relative feeding level index, the daily ration and the fraction of body weight consumed per day are calculated for each of eight cod length classes. The data indicate that prey size generally increases with predator size. A log-normal size selective preference function is proposed. The location and spread parameters of the preference function are each estimated twice, each time based on different assumptions about the distribution of the logarithm of the prey weight in the predator's stomach contents. The first assumption, a unimodal distribution, is confirmed. The second assumption, a normal distribution, cannot be demonstrated, although it is shown to be acceptable. Prey weight distributions in the sea are estimated, but those estimates are very sensitive to the spread parameter of the preference function.

Pacific Fishery Management Council Meeting

The Pacific Fishery Management Council met at the Bahia Hotel from July 11-12, 1984, in San Diego. Dr. Dan Huppert and Richard Klingbeil, a California Department of Fish and Game biologist, explained to the Council that the southern California purse seine fleet caught mainly Pacific mackerel during the previous year. Only 1,680 metric tons of anchovy were caught by the reduction fishery out of a 104,781 metric ton quota. Lack of demand by fish meal plants in Los Angeles and Pt. Hueneme caused the slump in anchovy reduction fishing. This presentation was based upon the SWFC Administrative Report LJ-84-23 written by Cindy Thomson and Richard Klingbeil.

Dr. Alec MacCall presented the 1984 anchovy spawning biomass estimate to the Council and its Scientific and Statistical Committee. Using the "egg production" method, MacCall estimated the biomass to be 309,000 metric tons, which results in a 1984-85 reduction fishery quota of 6,300 mt, and a total optimum yield for reduction, frozen bait and canning of 11,200 mt. Few comments or criticism of the estimate or procedures were received.

Economics Research Program

Cindy Thomson, Economist, completed updating all catch and fishing vessel data files for the Southern California purse seine fleet, and began revising the Huppert and Thomson analysis of California partyboat demand (Administrative Report LJ-84-06) in response to reviewer's comments.

Dr. Huppert, Cynthia Thomson and Chuck Korson, Economist at the Southwest Region, held a "source evaluation board" meeting on July 3 in La Jolla to evaluate six proposals submitted for a study of Pacific Coast trawl vessel depreciation and maintenance costs. The contract was subsequently awarded to Natural Resources Consultants, Inc., of Seattle, Washington.

Huppert collected necessary background information and began writing a paper entitled, "Pacific Coast Groundfish Management--Evolution and Prospects," which will be presented to the Conference on Fisheries Management: Issues and Options in Anchorage, Alaska, in November 1984.

OCEANIC FISHERIES RESOURCES DIVISION

La Jolla, California

Biological Fisheries Systems Investigations

SWFC Scientist Helps Develop Age Determination Procedure for Manatees

Aleta Hohn, Zoologist, recently returned from Florida where she worked with personnel from the U.S. Fish and Wildlife Service (FWS) to develop procedures to determine ages of manatees. The project, headed by Dr. Galen Rathbun of the FWS, involved personnel from the FWS Sirenia Project and students and staff from the University of Florida Veterinary Sciences School. Hohn participated in the project because of her experience with the age determination of dolphins and other species.

In dolphins, growth layers in teeth are commonly used for age determination. In manatees, however, there is constant tooth replacement as in elephants, but it occurs indefinitely throughout the life of the animal. Therefore, the number of dental growth layers only gives the age of the tooth, not of the animal. Instead, growth layers in bone show the most promise for age determination of manatees. Bones are used for age determination of many terrestrial mammals, as well.

During her work on the project, Hohn discussed current applications and preparation techniques for mammalian age determination based on calcified tissues. Hohn and FWS personnel prepared sections from different manatee bones to try to determine which bones may be acceptable for age determination (those with minimum resorption), and examined tetracycline-marked manatee bones from wild and captive specimens as a method of calibrating layers and Hohn demonstrated how to "read" these marks. Hohn also trained FWS personnel and students and staff to prepare bones and interpret growth layers so that they can begin an age determination program for manatees.

The FWS staff will now begin the task of developing the specific method that will provide the best results for age determination of manatees and proceed to age at least some of the specimens collected during past years.

Progress in the mtDNA Laboratory Reported

Dr. Andrew Dizon, Fishery Biologist, reports that work on cloning a molecule of dolphin mtDNA is nearing completion. Dr. Sarka Lucas, Molecular Biologist, Dizon, and Mwenda Kudumu, NOAA Jr. Fellow, are working on a project to study the mitochondrial DNA (mtDNA). In analyzing the sometimes poorly preserved samples, pure mtDNA, which is labeled with radioactive phosphate, is used to visualize the mtDNA from contaminating nuclear DNA. Since fresh marine mammal tissue samples are difficult to obtain on a predictable basis, the solution is to clone a sample of mtDNA, perpetuating the approximate 16,000 nucleotide molecule in a strain of E. coli bacteria. The process of

developing this strain is interesting and the technique is the cornerstone of the genetic engineering "revolution." The mtDNA (or nuclear DNA sequence) gets ligated into the DNA of the plasmid and the host bacterial cell is induced to take up a plasmid--a process called transformation. These plasmids, most of which are commercially available, are replicating extrachromosomal genetic elements found in a variety of bacterial species, often responsible for coding enzymes which are useful to the host (resistance to antibiotics, for instance). Although the final testing is not yet completed, it appears that the whole 16,000 nucleotide molecule of a dolphin mtDNA has been successfully cloned.

Marine Mammal Assessment Investigations

Ground Counts of Coastal Marine Mammals Compared with Counts from Aerial Photographs

LCDR Wayne L. Perryman, NOAA Corps, reports that progress has been made comparing counts made from aerial photographs of California sea lion and northern fur seal pups with ground counts of the two species of pups. The survey is part of a four-year program funded by the Marine Sanctuary Program. The program was developed to find a method for monitoring pinniped populations within the Channel Islands Marine Sanctuary with minimal disturbance to the rookeries.

Perryman traveled to San Miguel Island on July 9 to conduct ground counts of the pups. Calibration sites were selected in both rocky and sandy areas to determine whether substrate significantly affects pup detectability. In addition, mid-day behavior patterns for the two species of pups were recorded to aid in differentiating between the two. The final ground counts and the photographic overflight were conducted on July 19 and Lcdr Perryman returned to La Jolla on July 22.

In addition to comparing counts from ground surveys and aerial photographs at San Miguel Island, a photographic survey of sea lion pups was made at Santa Barbara Island on July 17. Ground counts were conducted by Sandra Hawes, Southwest Fisheries Center, and Sandy Diamond, California Department of Fish and Game. The ground count of sea lion pups was 280, a small increase over last year's count.

A summary of counts from ground surveys and aerial photographs is being prepared by Perryman. Counts from Pt. Bennett, San Miguel Island, and Santa Barbara Island for sea lions, elephant seals and fur seals will be compared over the three years of the study (1982-1984). The report will be available in January 1985.

Tuna Assessment Investigations

SWFC Scientists Participate in ICCAT's Working Group on Juvenile Tropical Tunas

Dr. Norm Bartoo reports that he and fishery biologist Dr. Pierre Kleiber recently participated in an intersessional meeting of the Standing Committee on Research and Statistics (SCRS) of the International Commission for the Conservation of Atlantic Tunas (ICCAT). The meeting, held in Brest, France, July 9-20, was a gathering of the Working Group on Juvenile Tunas. The working group met to review the current minimum size regulations on yellowfin and bigeye tunas, determine the effectiveness of the regulations, recommend continuance or elimination of the minimum size regulation on bigeye and evaluate other management measures that could be taken to raise the yield-per-recruit of yellowfin, bigeye and skipjack tunas in the eastern tropical Atlantic.

The working group considered alternative management measures such as time-area-gear closures which could reduce the catch of small fish. The Working Group concluded that, because of the mixing of small yellowfin and bigeye with skipjack (which do not need minimum size regulations) and larger yellowfin and bigeye, there are no combinations of time-area-gear that would result in a net increase in catch of the three species in aggregate. It is possible to effect small gains in the catches of yellowfin or bigeye individually, but these will be done at the expense of a decrease in total landings and will likely affect one gear more than others.

The conclusion of the participants is that the current minimum size regulations appear to be ineffective in raising the yield-per-recruit of yellowfin or bigeye tunas. The effectiveness of the regulations in discouraging increased catches of small fish could not be determined. Based on strictly biological considerations the Working Group recommended that the minimum size regulation on bigeye not be extended and also recommended the removal of the yellowfin tuna minimum size regulation.

Multispecies Data Management and Fisheries Monitoring Program

Summary of Data on the 1983 North Pacific Albacore Fishery Prepared

Atilio Coan reports that he, Anthony Majors, Forest Miller and Dr. Norman Bartoo completed and sent out to participating fishermen more than 400 copies of the 1983 North Pacific albacore data summary. Another 500 of these summary reports were sent to state fisheries agencies to be distributed at the

waterfront by samplers during the 1984 fishing season. During the 1983 albacore fishing season (April-November), an estimated 10,119 metric tons of albacore were landed at ports throughout the three U.S. coastal states and Hawaii. Areas fished included the traditional fishing grounds off the U.S. west coast to areas north of Hawaii and around Midway Island. The average length of albacore was 66.2 centimeters (14.5 lbs). Approximately 95% of the fish measured were taken from jigboats.

Estimated catch-per-unit-effort (CPUE) for the standard 45-foot (14 meter) jigboat in 1983 was 88 fish per day. Highest CPUE for the year (129 fish per day) was reported during the second half of August in areas 1300 nautical miles off the Oregon coast. Total sampled effort (days fished) for the season was 7,838 days. Approximately 75% of effort (5,888 days) was spent in areas east of 140° west longitude. Average sea-surface temperatures for 1983 in inshore areas (coastline to 200 miles) were 1.0 to 2.0°C above normal. Average sea-surface temperatures in offshore areas were 2.0 to 3.0°C below normal. Best temperature fronts were found inshore within 200 miles of the U.S. coast, particularly in areas north of 40° north latitude. The summary of the data was published as Administrative Report No. 84-13 and is available to those interested.

Status of 1984 Tuna/Dolphin Observer Data Reported

Al Jackson, biological technician, reports that no tuna/dolphin observers departed in July on cruises aboard commercial tuna seiners fishing in the eastern tropical Pacific. Four observers completed cruises this month. One of these observers had been collecting data for the National Marine Fisheries Service (NMFS); the other three observers had been collecting data under the direction of the Inter-American Tropical Tuna Commission (IATTC). Data collected on two NMFS cruises (884 and 889) were edited by biological technician Tom Tumosa. The table below summarizes the status of tuna/dolphin observer data collected this year to date:

Cruise number	Cruise type	Vessel return	Data received	Data edited	Database loaded
876	IATTC	2-15-84	*	*	*
877	IATTC	3-05-84	*	*	*
878	IATTC	4-02-84	*	*	*
879	IATTC	4-10-84	*	*	*
880	IATTC	5-10-84	*	*	*
881	IATTC	6-29-84	*	*	*
882	IATTC	6-28-84	*	*	*
883	IATTC	7-11-84	*	*	*
884	NMFS	6-13-84	6-22-84	7-31-84	
885	IATTC	7-03-84	*	*	*
886	IATTC	7-11-84	*	*	*
887	NMFS				

888	NMFS	7-23-84			
889	NMFS	6-25-84	7-06-84	7-27-84	
890	NMFS				
891	NMFS				
NMFS Total	6	3	2	2	0

*Data collected on IATTC cruises are not routinely incorporated into SWFC-managed databases.

Marine Bird Data Base Updated

Jackson also reports that data collected by biological technician Robert L. Pitman during the February 1984 cruise aboard the NOAA Ship Discoverer were edited and added to the marine bird data base (BIRDDb). These data included bird counts, sighting effort and environmental conditions for 68 days of high seas bird observations. BIRDDb now contains data for 930 days of birding conducted by Pitman over the past 10 years.

In conjunction with BIRDDb, a bird code data base (BDCDDb) was established. This data base contains a numerical and alphabetical code as well as scientific and common names for more than 300 species of birds found within the marine environment. BDCDDb facilitates the generation of more readable reports by allowing for computerized translation of coded field data to common and/or scientific names.

PACIFIC ENVIRONMENTAL GROUP

Monterey, California

Large Quantities of Juvenile Anchovies and Rockfishes Reported

Unusually large quantities of juvenile anchovies and rockfishes have been reported by the National Marine Fisheries Service, California Department of Fish and Game, and fishermen in central California. Reports of large numbers of small anchovies, bocaccio, shortbelly rockfish and other rockfish were received from Santa Cruz, Monterey, Point Sur, and Morro Bay. The last previous such occurrence was in 1977 when large numbers of juvenile rockfishes were reported over a large area off the coast of central California. In 1977 research personnel at PEG reported that the increased abundance of juvenile rockfish was associated with an unusually calm winter. Anchovies and many of the central California rockfish stocks are late winter spawners and the juveniles appear in the nearshore area in early summer. Fishery biologists at the Southwest Fisheries Center have shown that reproductive success of anchovies is associated with plankton patches which are dispersed by wind storms. The present abundance of juvenile anchovies and rockfishes in central California is also associated with a very calm winter. Upwelling indices indicate abnormally low values from January 1984 to March 1984. (Figure 1).

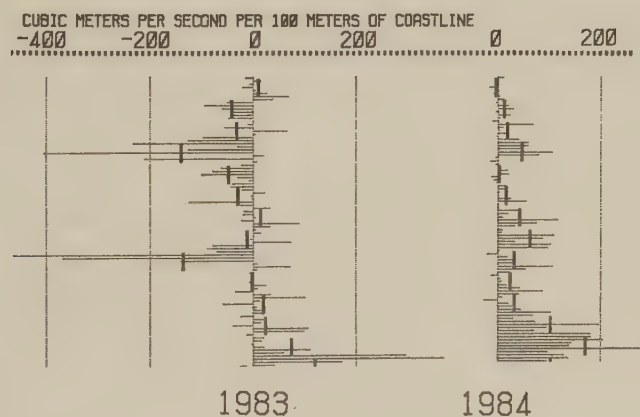


Figure 1. Central California (36°N 122°E) upwelling indices for January - March in 1983 and 1984.

In contrast, 1983 was characterized by a near absence of juvenile anchovies and rockfish in Central California. Both the 1977 and 1984 events occurred in the year following an El Niño. The 1976 El Niño was mild, whereas the 1983 El Niño was one of the most severe on record.

TIBURON LABORATORY

Tiburon, California

Underutilized Fishery Resources Investigation

Fishing Vessel Chartered to Study Fishery Potential of Pelagic Red Crabs and Other Crustaceans

The commercial trawler, Gus D., out of Morro Bay was chartered for five days, July 13-18, to locate and catch pelagic red crab (*Galatheidæ*, *Pleuroncodes planipes*) and other species near the Channel Islands. Cruise Leader Sus Kato and fishery biologist Sennen Salapare report that the chief purposes of the charter were to learn if red crab was still abundant in southern California, and to collect samples for analyses and test marketing. Secondary objectives of the cruise were to collect market samples of large ocean shrimp and ridgeback prawn, and to conduct experimental fishing for octopus and sergestid shrimp.

The arrival of El Nino in 1982 was, generally, a disaster for most fishermen because many commercial fish species moved from traditional fishing grounds. In their place came hordes of pelagic red crab, which have no immediate commercial use, although its value as an aquaculture feed ingredient had been demonstrated by researchers at the Northwest and Alaska Fisheries Center's Utilization Division. Inclusion of red crab in the diet of pen-cultured salmon produced the characteristic "salmon" color in the flesh.

There is also a possibility that pigments in red crab could be used as food dyes. Japanese researchers are reportedly working on krill as a source of food dyes to replace synthetic ones that are being phased out by the government. Red crab can also be used to enhance the flavor of fish products for human consumption.

After two days of searching with short bottom trawl tows and, more importantly, conversing over the radio with fishermen and processors, a large concentration of red crab was located near Santa Cruz Island. A single, half-hour tow with twin-rig shrimp trawls (two nets) produced more than 10,000 pounds of red crab. Most of these were returned alive into the sea, but 300 pounds were kept alive in a large tank of seawater. The crabs were taken to Santa Barbara where, with the aid of Mike Wagner of Seafood Specialties, they were minced and frozen in plastic bags.

The charter cruise was then resumed. Due to Captain Frank Donahue's knowledge of shrimp distribution, ridgeback prawn and ocean shrimp were easily found and captured. The ocean shrimp, which averaged about 40 whole shrimp per pound--much larger than the 100-count shrimp which is usually found in the northern California shrimp fishery--were taken to Pacific Marine Products Corporation's plant in Ventura where the firm's personnel helped prepare a sample of fresh shrimp for Japanese buyers to taste.

A string of 19 octopus traps was set in 7-8 fathoms of water at Government Point, near Point Conception, where mud-flat octopus was reported to be abundant. Two Sea Grant employees, Laura Manning and Karen Worcester, joined the cruise to help haul the traps and to aid in other activities. They, together with Marine Advisor John Richards, helped with the shoreside processing of samples. Only three small octopuses were caught in the traps, along with some 300 crabs, most of which were small portunid and rock crabs.

Two daylight tows for sergestid shrimp were made with a Tucker trawl net (plankton net) in depths of 40-50 fathoms where a weak scattering layer was discernible on the fathometer. Sergestid shrimp are commonly caught by trawlers in nearby waters, but they were not found in either tow. These shrimp, known as "Sakura-ebi" (cherry-blossom shrimp), are in great demand in Japan.

Upon returning to the Tiburon Laboratory, Salapare and Kato aided by fishery biologist William Leet and Jr. Fellow Frank Jacques, prepared the collected samples for analyses. Most of the red crab will be sent to a new crayfish waste processing plant in Louisiana where the carotenoid pigments will be extracted. The product will then be distributed to several firms interested in using the pigments. A small amount of red crab was given to a processor who intends to make some experimental food products, and some will be used in crab-flavored fishcake, which will be served at a seafood show in Santa Barbara.

A sample of ridgeback prawn was cooked in salt water and sent to the University of California at Davis where Sea Grant Food Technologist Robert Price dried the shrimp. Kato and Salapare will investigate the economics of producing dried shrimp for the domestic Oriental market. Some ridgeback shrimp and ocean shrimp were brined and smoked in a small, hot-smoke oven. Both products may have a place in the seafood market; most Tiburon Laboratory personnel who tasted them liked the flavor. Samples of raw, whole ocean shrimp were frozen for later distribution to domestic sushi restaurants to determine if they are an acceptable sushi ingredient. Although spot prawn (*Pandalus platyceros*) is the principal raw shrimp served in sushi restaurants, it is likely that large ocean shrimp would be an acceptable substitute.

Physiological Ecology Investigation

California Fish and Game Personnel Analyze Striped Bass for Monitoring Program

California Department of Fish and Game biologists have processed 40 prespawning striped bass to obtain data for their monitoring study. California Fish and Game personnel Jim White, Tom King, and Roger Johnson worked at the Tiburon Laboratory, July 23 - 27, with instruments that are not yet available at their laboratory to complete analyses for the 1984 striped bass study.

The three researchers met with Michael Bowers to prepare tissue slides of ovary samples and with Dr. Jeannette Whipple to interpret the histopathology of eggs from slides. Pete Benville also worked with the team in analyzing liver samples for monocyclic aromatics and alicyclic hexanes by gas chromatography. California Fish and Game will use these data to predict the current health status of the striped bass population in the San Francisco Bay-Delta. The new findings will also be compared with previous data collected for the area in past years.

ADMINISTRATIVE ACTIVITIES

A-76 Update

Arthur Young and Company revised the Draft Management Efficiency Study for the SWFC A-76 review; the Center received a copy on June 27, 1984. There were no substantive changes made in the study. Comments from the Center on the revised Study were sent to NOAA's Contracting Officer, who wrote to Arthur Young about NOAA's concerns with the Study. A meeting with Arthur Young is scheduled for August 7.

MISCELLANEOUS

Public Affairs

Honolulu Laboratory

- July 18 - Richard S. Shomura presented a talk, "Status of the tuna industry today," to the Waikiki Rotary Club at the Hawaiian Regent Hotel.

Tiburon Laboratory

- July 16 - Pete Adams presented a seminar at the Point Reyes National Seashore on oceanic conditions during the 1981-1982 El Nino.

Seminars

Pacific Environmental Group

- July 23 - Dr. Colin Grant, Australia Department of Primary Industry gave a seminar on "The Fisheries of Australia.

Tiburon Laboratory

- July 25 - Dr. Colin Grant, Director, Resource Management Section, Fisheries Division, Australian Department of Primary Industry, spoke on "Australian Fisheries and Their Management."

Press Release

Tiburon Laboratory

- July 6 - "NMFS Scientists Return from Research Cruise."

Honors and Awards

La Jolla Laboratory

On July 19, 1984, Director Izadore Barrett presented awards to staff members during ceremonies in the courtyard of the Southwest Fisheries Center in La Jolla, California. Employees who received a Special Act Award were: Roy Allen, David Ambrose, Morgan Busby, Ronald Dotson, Tod Foster, John Hedgepeth, Susan Iacometti, Barbara MacCall, Henry Orr, Elaine Sandknop, Christina Show, Eugene Sibbald, Elizabeth Stevens, Tom Tumosa, Jay Walker, Jeanne Wexler. A Quality Step Increase was awarded to: Jay Barlow, Jack Brown, Aleta Hohn, Virginia Hostler, Alan Jackson, Richard Methot, Albert Myrick, Jr., Robert Nydam, Stephen Reilly, Dorothy Roll, Barbara Watkins. Employees who received a Sustained Superior Performance Award were: Louis Arnell, Robert Bistodeau, Richard Charter, Susan Chivers, John Cologne, Laurence Eber, Barbara Engstrand, Paul Fiedler, William Flerx, James Gilpatrick, Daniel Gittings, Larry Hansen, Sandra Hawes, Nancy Lo, Eric Lynn, Merle Marrow, Laura Patla, Lorraine Prescott, Julie Shoemaker, James Squire, Gail Theilacker, James Thrailkill, Brian Vorndam, Bruce Wahlen, Ken Wallace and Laura Wing.



Southwest Fisheries Center employees who received awards.

Jim Thrailkill Marks 40 Years of Government Service



Dr. Reuben Lasker, Chief of the Coastal Division, at right, congratulates fishery biologist James Thrailkill on his completion of 40 years of federal service and presents him with a length of service pin.

Jim Thrailkill has the longest federal service record of any employee at the La Jolla Laboratory. As the Leader of the Coastal and Pacific Fisheries Investigation within the Coastal Division at La Jolla, California, Thrailkill is responsible for ensuring that the oceanographic-biological cruises of the NOAA Ship David Starr Jordan provide the environmental and biological data needed by scientists at the Southwest Fisheries Center and that the data deposited in the CalCOFI data base is error free.

Thrailkill's career in the federal government began in 1943 when he interrupted his fisheries studies at Oregon State University (OSU) to enlist in the Army during World War II. He was sent to the China-Burma-India theater where he surveyed for the pipeline carrying diesel and aviation fuel from India to China.

Returning to OSU Thrailkill completed his degree in fisheries and went to work for the U.S. Department of the Interior's Fish and Wildlife Service as a fishery biologist investigating salmon and striped bass in the San Joaquin-Sacramento delta.

In 1947, Thrailkill transferred to the U.S. Geological Survey in Idaho as a surveyor and in 1949 transferred again to the Sardine Investigation of the Fish and Wildlife Service in San Diego, California. Working out of an old

barracks building on the grounds of the Naval Electronics Laboratory in Point Loma, Thrailkill helped mount the monthly series of cruises conducted on the Fish and Wildlife Service's research vessel, Black Douglas.

In the ensuing years Thrailkill continued to supervise the sampling aboard ship with plankton net and trawl and the planning of research cruises. His supervision of the processing of plankton samples and data production, from sorting to editing, has been an essential element in providing information for the annual anchovy biomass assessment.

Thrailkill is the author of the series of Special Scientific Reports on zooplankton volumes off the Pacific Coast. He has co-authored (with the late Dr. Elbert Ahlstrom) several papers on the subject of plankton volume loss with time of preservation, and collaborated in the development of a high speed plankton sampler.

In his leisure time Thrailkill enjoys bridge and golf and has recently developed an avid interest in photography.

Visitors

Honolulu Laboratory

- July 9 - Dr. Chris Boggs, National Research Council Fellow at the La Jolla Laboratory, visited Richard Shomura.
- Henry Sesepasara of the American Samoa Office of Fisheries met with Richard Shomura, Richard Uchida, Dr. Robert A. Skillman, Dr. Jerry A. Wetherall, Dr. Jeffrey Polovina, and Gordon Yamasaki to discuss bottom fish research in American Samoa.
- 12 - Dr. James D. Parrish of the Hawaii Cooperative Fishery Research Unit (and chairman of the subcommittee on bottom fish of the Scientific and Statistical Committee, Western Pacific Regional Fishery Management Council (Council), visited Richard Shomura to discuss the Council's bottom fish fishery management plan.
- F.G. Hochberl of the Santa Barbara Museum of Natural History visited Michael P. Seki and Richard Shomura.
- 26 - Dr. Ichiro Yamanaka, Far Seas Fisheries Research Laboratory, Shimizu, Japan, visited Richard Shomura and Richard Uchida.
- S. Inaba, President of Asahi Chemical Industry America, Inc., (ACIAI), visited Dr. Jeffrey Polovina and Dr. George Boehlert to discuss artificial reefs and the deployment of the fiber glass reinforced plastic reef purchased by the Laboratory from ACIAI.

- 30 - F. Achmad and N. Siregar, Marine Fishery Development Center, Semarang, E. Java, Indonesia visited the Laboratory. They are in the United States for short-term training in fishing gear and fishing methods in Pascagoula, Florida, and in fish aggregating devices in Honolulu.

La Jolla Laboratory

- July 20 - Mr. Abdul Rasheed Hussain, Executive Secretary to the President of the Republic of Maldives, met with Izadore Barrett and Gary Sakagawa at the Center.
- Paul M. Wolff, Assistant Administrator for National Ocean Service, NOAA, Washington, DC, met with Izadore Barrett at the Center.

Pacific Environmental Group

- July 5-13 - Daniel Pauly, International Center for Living Resources Management, Manila Phillipines discussed Environment Dependent Population Modeling of the Peruvian anchovetta.
- 23 - Arlene Bird representing Chris Mooers of the Naval Postgraduate School Oceanography Department visited PEG and discussed getting Ship-of-Opportunity XBT data for use on the NPS IBM 3033 computer.

Tiburon Laboratory

- July 9 - Geoff Grantham, Research Scientist, and John Jurcsak, Purchasing Manager, Kalkan, visited Sus Kato to look into the feasibility of using shortbelly rockfish in pet food.
- Brad Moran, commercial diver from Santa Rosa, visited Sus Kato to discuss fishing for sea urchins.
- 23 - Stacy Hall, Servicios de Fomento Industrial, Mexico City, met with Sus Kato and Norman Abramson to discuss fisheries development in Mexico.
- 25 - Dr. Colin Grant, Director, Resource Management Section, Fisheries Division, Australian Department of Primary Industry, visited the Laboratory.
- K. Takayama, Wesson, visited Sus Kato to pick up samples of ocean shrimp and ridgeback prawn.

- 26 - Douglas Lytle interviewed Norman Abramson for the San Rafael Independent-Journal.
- T.A. Thrush, Berger and Co., met with Sus Kato to learn about processing of sea urchins.

Meetings and Travel

Honolulu Laboratory

- July 9 - Richard Shomura participated in a meeting of the Northwestern Hawaiian Islands Coordinating Council in the conference room.
- 27 - A meeting was held between Laboratory and Western Pacific Program Office (WPP0) personnel to discuss the NMFS Habitat Conservation Policy as it relates to Hawaiian and western Pacific waters. Participants included Richard Shomura, who convened the meeting, Richard Uchida, Dr. George W. Boehlert, William G. Gilmartin, Dr. Jeffrey Polovina, Dr. Stephen Ralston, and Robert T.B. Iversen, John J. Naughton, and Eugene T. Nitta from WPP0.

La Jolla Laboratory

- July 3 - Dave Mackett and Izadore Barrett traveled to Terminal Island to meet with Regional Office personnel.
- 3-10 - Sandy Hawes went to Santa Barbara Island to census sea lions, and collect sea lion scats.
- 5-6 - Fred Kellenberger evaluated the computer systems at PEG and the Tiburon Laboratory.
- 8-31 - Michael Laurs went to Victoria, British Columbia, Canada, to moderate a session and present a paper on El Nino at a Western Division of American Fisheries Society meeting.
- 9 - Fred Kellenberger visited Terminal Island to discuss Southwest Region ADP plans and orientation for new SWFC ADP employees.
- 9-23 - Reuben Lasker traveled to Barcelona, Spain, to lecture at the Instituto de Investigaciones Pesqueras de Barcelona, and to Paris, France, to attend a Guiding Group of Experts meeting on Ocean Sciences Related to Living Resources.

- 9-25 - Wayne Perryman went to San Miguel Island to provide ground truth counts during aerial photographic censusing.
- 10-11 - Dan Huppert and Alec MacCall attended the PFMC scientific and statistical committee meeting in San Diego, California.
- 10-12 - John Hunter traveled to Woods Hole, Massachusetts, to participate in joint Fishery Ecology project of Northwest Fisheries Center, NMFS and Woods Hole Oceanographic Institution.
- 10-22 - Norm Bartoo and Pierre Kleiber went to Brest, France, to participate in Juvenile Tuna Working Group Meeting of the ICCAT and to attend a SCRS Officers meeting.
- 18-21 - Doug DeMaster traveled to Fairbanks, Alaska, to attend a Marine Mammal Commission meeting.
- 19-23 - Chuck Oliver and Jeanne Wexler traveled to San Clemente Island to conduct peak counts of sea lion pups.
- 22-26 - Gary Sakagawa traveled to Miami, Florida, to participate in a review meeting of bluefin tuna research.
- 25-27 - Lillian Vlymen and Jean Michalski attended a Public Affairs workshop in Washington, DC.
- July 26- - Izadore Barrett traveled to Juneau, Alaska, to attend
August 2 a Research Council and Center Director's meeting.
- July 30 - Fred Kellenberger participated on the advisory committee in the site review by the National Science Foundation on the proposal for the San Diego Super Computer.

Pacific Environmental Group

- July 5-6 - Dick Parrish traveled to La Jolla to participate in an albacore budget review.
- 16-20 - Andrew Bakun traveled to Paris, France, to serve as SCOR (Scientific Committee on Ocean Research) representative at a meeting of the Guiding Group of Experts for the International Recruitment Program (REP), sponsored by the Intergovernmental Oceanographic Commission.

Tiburon Laboratory

- July 10 - Bruce MacFarlane attended a meeting of the Regional Effects Technical Advisory Committee in Oakland, California.
- 17 - Bill Lenarz traveled to Menlo Park, California, to work with Frank Henry of the Department of Fish and Game on groundfish sampling computer programs.
- 18-24 - Ted Hobson, Tony Chess, and Dan Howard conducted their quarterly monitoring at Catalina Island, California.
- 21-23 - Ted Hobson, Tony Chess and Dan Howard attended the USC workshop on methods of assessing fish populations at the Catalina Marine Science Center.

Personnel

Honolulu Laboratory

- July 8 - Alan R. Everson, Biological Technician - Conversion to Temporary Appointment.
- 27 - Frederick C. Sacchet, Computer Programmer - Extension of Temporary Appointment.
- James E. Tharpe, Computer Programmer - Extension of Temporary Appointment.

La Jolla Laboratory

- July 8 - Marlene Johnson, Biological Science Trainee - Promotion.
- 16 - Sandor Kaupp, Biological Technician - Entered on Duty.
- Huoung Bui, Computer Assistant - Entered on Duty.
- Robert Pitman, Biological Technician - Entered on Duty.
- 22 - John Michno, Biological Science Trainee - Promotion.
- Robert Bistodeau, Computer Programmer - Entered on Duty.
- Larry Zins, Computer Programmer - Entered on Duty.
- 27 - Susan Richardson, Clerk-Typist - Resignation.
- 30 - Jerry Hornoff, Programmer Analyst - Entered on Duty.

- 31 - John Cologne, Economist - Resignation.
- Charles Kokes, Biological Technician - Termination of Appointment.

Tiburon Laboratory

- July 23 - Susan Daves, Clerk-Typist - Entered on Duty.

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